

Ankur Singh

Research Engineer @ A*STAR

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Academic Qualifications

Year	Degree	Institute
Aug 2020 - Sep 2021	M.Tech, Electrical Engineering	Indian Institute of Technology, Kanpur
Aug 2016 - July 2020	B.Tech, Electrical Engineering	Indian Institute of Technology, Kanpur
March 2015	AISSCE	Air Force School, Viman Nagar, Pune
March 2013	AISSE	Air Force School, Viman Nagar, Pune

Research Interests

- Deep Learning, Computer vision, Domain Generalization, Incremental Learning, Self-Supervised Learning

Scholastic Achievements

- Secured All India Rank 636 in IIT-JEE Advanced 2016 (99.682 percentile)
- Secured 99.18 percentile in JEE Mains 2016
- Holder of Prime Minister Scholarship

Publications

- **Multi-Input Fusion for Practical Pedestrian Intention Prediction** , Ankur Singh, Upendra Suddamalla .
- Accepted at ICCV Workshops 2021 [Link]
- **The Curious Case of Convex Networks** , Sarath Sivaprasad, Ankur Singh, Naresh Manwani, Vineet Gandhi.
- Accepted at ECML 2021 [Link]
- **Pedestrian Intention Prediction with Multi-Input Concatenation**, Ankur Singh, Upendra Suddamalla.
- Accepted at CVPR Workshops 2021 [Link]
- **CT Image Synthesis Using Weakly Supervised Segmentation and Geometric Inter-Label Relations For COVID Image Analysis**, Dwarikanath Mahapatra, Ankur Singh, Behzad Bozorgtabar. - Under Review at MedIA [Link]
- **Semi-Supervised Super-Resolution**, Ankur Singh, Piyush Rai. - Preprint [Link]
- **Video Colorization using CNNs and Keyframes Extraction: An application in saving bandwidth**, Ankur Singh, Anurag Chanani, Harish Karnick. - Accepted at CVIP 2019 Oral [Link].

Experience

- **Research Engineer with A*STAR, Singapore** (Sep '22-)
Domain Generalization, Continual Learning
 - Implemented knowledge distillation techniques to design generalizable neural networks for image classification tasks
 - Designed an evolving fully connected networks for addressing continual learning problems in time-series data
- **Perception Engineer with Moovita Singapore** (Oct' 21-Sep '22)
Multi-Task Learning
 - Developed and trained a novel Multi-Task Network (MTN) capable of lane segmentation and object detection.
 - Generated a dataset of 15,000 images with lane markings to train a computer vision model for autonomous driving
 - Introduced lane instance segmentation in multi-task network, improving lane segmentation.
- **Consultant with Moovita Singapore** (Sep' 20-Oct' 21)
Pedestrian Intention Estimation (ICCV W '21 [Link], CVPR W '21 [Link])
 - Proposed an intention prediction network that utilizes pedestrian bounding boxes, pose, bounding box coordinates.
 - The network implicitly learned pedestrians' motion cues and location information to differentiate between intentions.
 - Experimented with different combinations of input features and proposed multiple efficient models.
- **M.Tech thesis with Prof. Piyush Rai, Prof. Vipul Arora, IIT Kanpur** (Sep' 20-Sep' 21)
Semi-Supervised Super Resolution [Link]
 - Introduced a semi-supervised approach to tackle the problem of Single-Image Super-Resolution using ESRGANs.
 - Proposed a consistency loss to convert unpaired low-resolution images to high-resolution images.
 - Proved the efficacy of the proposed approach over other methods through quantitative and qualitative experiments.

- **Research Assistant** *with Prof. Vineet Gandhi, IIIT Hyderabad* (Aug' 20-Nov '20)
Convex Neural Networks (ECML '21 [Link])
 - Investigated a constrained formulation of neural networks where the output is a convex function of the input.
 - Showed that these networks have outstanding generalization ability and robustness to label noise
 - Experiments showed that convex MLP networks outperform vanilla MLP on standard image classification datasets
- **Research Assistant** *with Dr. Dwarikanath Mahapatra, Inception Institute of AI* (April '20-July '20)
Medical Imaging for Covid Image Analysis [Link]
 - Generated synthetic images to train networks for segmenting COVID-19 infected areas from lung CT images.
 - Introduced a weakly supervised segmentation (WSS) step that segments a CT image into different labeled regions.
 - The generated segmentation maps are used to model the geometric relationship between the different pathological regions.
- **Research Assistant** *with Prof. Vinay Namboodiri, IIT Kanpur* (May '19-Nov '19)
Adversarial Incremental Learning [Link]
 - Formulated an approach using **Adversarial Learning** to tackle class-incremental learning in image classification.
 - The proposed model neither used exemplars nor any generative examples to preserve information about the old tasks.
 - Obtained **state of the art results** in class-incremental learning on CIFAR-100, MNIST and SVHN datasets.
- **Research Assistant** *with Prof. Harish Karnick, IIT Kanpur* (Aug '18-Nov '18)
Video Colorization (CVIP '19 Oral [Link])
 - Developed an end to end framework that **extracts key frames** from a colored video and **trains a Convolutional Neural Network** from scratch on these colored frames.
 - Saved **two thirds** of bandwidth while transmitting a video using the proposed method.
 - The whole process starting from key frames extraction to training a model and then obtaining the colored output video, happened in **near real-time** using the proposed method.
- **Intern** *with Vios Medical, Bangalore* (May '18-July '18)
ECG arrhythmia classification using 2D CNN [Link]
 - Used **2-Dimensional CNNs** instead of the traditional LSTM models to detect arrhythmia in ECG signals.
 - Achieved an accuracy of **98.31** in classifying 6 different types of arrhythmia using different classification networks
 - **Github Repository** of the project currently has **215 stars** and **103 forks**

Other Projects

- **Medical Imaging for Breast Cancer detection** (Apr '20-May '20)
 - Worked on BACH Grand Challenge for Computer Aided Detection of Breast Cancer from medical images.
 - Utilized self-supervised learning techniques to pre-train networks for improved performance on limited medical data.
 - Achieved a test set accuracy of 89% through the implementation of the self-supervised learning technique
- **GANs** (Apr' 20)
 - Conducted a literature survey on different GANs including Least Squares GANs, Cycle GANs, and SR GANs.
 - Implemented Least Squares GANs, Cycle GANs, and Super-Resolution GANs using Pytorch.
- **Self-Supervised Learning** (Aug '19-Nov '19)
 - Conducted a literature review on various self-supervised learning techniques utilizing different pretext tasks.
 - Experimented with various pretext tasks, including predicting image rotations and edge-detection.
- **Hierarchical Face localization and Drowsiness detection** (Dec '18)
 - Developed an efficient method for hierarchical face localization and drowsiness detection, with near-realtime processing.
 - Applied temporal analysis techniques to video data for accurate drowsiness detection.
- **Word Boundary detection** (Aug '18 - Nov '18)
 - Implemented the use of MFCC vectors and spectrograms to identify word boundaries in speech data.
 - Utilized convolutional neural networks to spectrogram data for word boundary detection.
- **Tweets Classification** (Dec '17)
 - Employed LSTM and Bidirectional LSTM techniques to classify tweets mentioning personal intake of medicine on Twitter.
 - Used self trained word embedding models to pre process the tweets using Word2Vec.

Technical Skills

- **Programming Languages:** Python, C++, Matlab
- **Machine Learning Tools:** Pytorch, Keras, Tensorflow, Sklearn, Numpy, OpenCV, Pandas, NLTK, Matplotlib, PIL